

Experiment: Osmosis in sweet and strong onions

Aim

To find out if there is a higher concentration of salts in the cytoplasm of strong onions onion cells compared to sweet onion cells using osmosis and plasmolysis.

Background



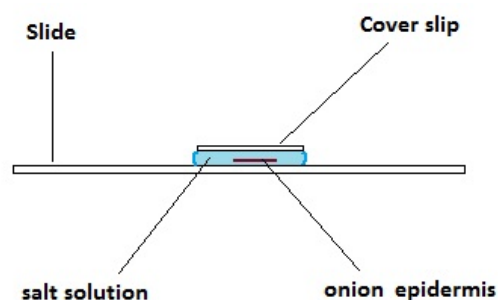
Osmosis is the movement of water through a partially permeable membrane from a dilute solution to a more concentrated solution. When a cell is in a solution with a higher salt concentration than its cytoplasm, water is lost by osmosis. If this continues for any time then gaps will appear between the cell wall and the cell membrane. This is called plasmolysis.

We can use plasmolysis to show the concentration of cell cytoplasm. When 50% of the cells show signs of plasmolysis in a given solution then we estimate that the solute concentration of the solution must be equal to the cell cytoplasm.

In this experiment you will test onion cells in different solute concentrations. Using a scatter graph of the results you will estimate the solute concentration when exactly 50% of the cells show plasmolysis. You will discover whether there is any difference in the solute concentration of the cytoplasm in the two types of onion.

Apparatus

- 6 microscope slides and cover slips,
- 6 concentrations of sodium chloride solution (0.0M, 0.25M, 0.5M, 1.0M, 1.5M and 2.0M),
- 1 dropping pipette and paper tissue
- epidermis samples of two varieties of onion,
- microscope



Method

1. Label six slides with the six salt concentrations.
2. Put two drops of each salt solution onto each slide.
3. Add a small piece of epidermal tissue from an onion to each slide, and then a cover slip.
4. Study the onion cells on the first slide under the microscope at x100 magnification.
5. Wait 2 minutes to allow osmosis to take place.
6. Count the total number of cells in the eyepiece view.
7. Count the number of plasmolysed cells in the same view.
8. Repeat steps 6 & 7 at two different places on the slide, so you have three repeats.
9. Repeat steps 6 to 8 for each concentration of salt solution.
10. Record all your results in a table.
11. Write a short paragraph of qualitative observations, ie. things you observed about the cells during the experiment in addition to the numbers of cells.

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Data processing

- Calculate the % of plasmolysed cells on each slide.
(% plasmolysed = no. plasmolysed / total no. of cells x 100)
- Make a table of these values.
- Write a short explanation of how you did the percentage calculation.
- Plot an x-y scatter graph of salt concentration against % of plasmolysed cells for each onion.
- Draw a best fit line over the data on each scatter graph.
- Work out using your best fit line the sodium chloride concentration which would result in 50% plasmolysis for each type of onion. This represents the concentration of the cytoplasm of the cell.

Conclusion

- Describe the two scatter graphs.
- Give a short explanation of how you calculated the solute concentrations using the graphs.
- Explain if the results show a difference in cytoplasm concentration between each onion?
- What limitations did you find in the method?
- How could you improve the experiment to reduce each limitation?